

FIG 2. Relationships between EW and OVM sIgE antibody concentrations (n = 80). Scatter plot shows the individual sIgE titers to EW (x-axis) and OVM (y-axis) from challenge-positive (■; n = 27) and challenge-negative (○; n = 53) patients.

Moreover, precise instructions regarding the cooking of the egg product are required to release a child from egg restrictions.

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Outcomes of 100 consecutive open, baked-egg oral food challenges in the allergy office

To the Editor:

Egg allergy is exceedingly common in pediatric patients, with a prevalence of challenge-proven allergy reported to be as high as 8.9% in a recent birth cohort study from Australia.¹ While this high prevalence reflects reactions following ingestion of raw or lightly cooked egg, many recent reports suggest that up to 70% of these egg-allergic patients can tolerate extensively heated or baked egg.²⁻⁶ Tolerance of baked egg is undoubtedly a clinically relevant phenotype as it allows for the social and nutritional benefits of an expanded diet with baked-egg products. Perhaps more important, however, is the fact that tolerance and ingestion of baked egg appears to accelerate the development of tolerance to natural/raw egg. Like oral immunotherapy, it has been associated with decreased skin test wheal diameters, decreased ovalbumin-specific IgE (sIgE) levels, and increased ovalbumin-specific and ovomucoid-specific IgG₄ levels.^{2,3} With these advantages in mind, we recently began to perform open oral food challenges

TABLE I. Baseline demographics and characteristics

	All patients (n = 100)	Passed OFC (n = 66)	Failed OFC (n = 31)	P value*
Age (y), median (range)	5.9 (1.2-19.8)	5.6 (1.2-19.8)	6.1 (1.9-14.8)	.3
Males	58.0	60.6	54.8	.7
History of asthma (%)	52.0	47.0	64.5	.1
History of allergic rhinitis (%)	60.0	57.6	64.5	.7
History of atopic dermatitis (%)	70.0	69.7	71.0	1.0
History of ingestion/reaction (%)	65.0	66.7	67.7	1.0
History of anaphylaxis to egg (%)	8.0	10.6	3.2	.4

*P values represent "passed OFC" as compared with "failed OFC" by using the Mann-Whitney U test for nonparametric groups and the Fisher exact test for categorical data.

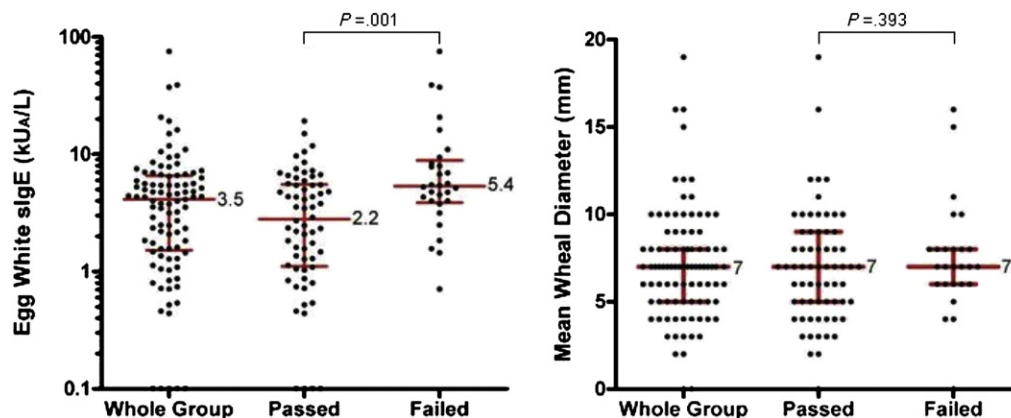


FIG 1. Egg white serum sIgE levels and skin test results. Numbers and bars represent medians with interquartile (25%-75%) ranges. P values were established by using the Mann-Whitney U test for comparison of medians between nonparametric groups.

TABLE II. Specificity, sensitivity, and predictive values for various serum egg white sIgE levels* in this cohort

Egg white sIgE value (kUA/L)	Sensitivity	Specificity	Positive predictive value	Negative predictive value
2.5	0.87	0.48	0.44	0.89
5.0	0.56	0.69	0.46	0.77
10.0	0.20	0.94	0.60	0.71

*Egg white sIgE level was measured with ImmunoCAP (Thermo Fisher Scientific, Portage, Mich).

(OFCs) with a regimented baked-egg recipe in our outpatient food allergy clinic. In this letter, we report the results of the first 100 open baked-egg OFCs.

The study protocol was approved by the Institutional Review Board of the Mount Sinai School of Medicine, and waiver of informed consent was granted for this retrospective chart review. The review was performed on all patients referred for OFC at the Jaffe Food Allergy Institute at the Mount Sinai School of Medicine in 2011, and the first 100 consecutive patients who had an open OFC to baked egg were included in this analysis. All patients were referred for open OFC by 7 allergists on the basis of their clinical impression in conjunction with family interests. No cutoff serum IgE value or skin test size precluded challenge. Children with a history of severe anaphylaxis to egg in the past 24 months and those with a history of convincing reactions to baked egg in the past 6 months were not offered baked-egg challenges. Serum sIgE levels to egg white (ImmunoCAP; Thermo Fisher Scientific, Portage, Mich) and/or skin prick test by using standardized egg

white extract (Greer Laboratories, Lenoir, NC) were performed on all patients, as previously described.⁷ The OFCs were performed in the outpatient office setting by a trained nurse or a physician per guidelines established by the AAAAI Working Group on Food Challenges, with challenges using incremental doses (such as 1/8, 1/8, 1/4, 1/2 muffin) every 15 minutes until a serving size was ingested (typically 4-5 doses).⁸ The baked-egg product was prepared at home by the parent in the form of a muffin that contained one-third of a whole egg and was baked at 350°F for 30 minutes according to a specific recipe (see Table E1 in this article's Online Repository at www.jacionline.org). For subjective symptoms, challenges were temporarily suspended and then continued following the resolution of symptoms, if the supervising physician considered it safe to proceed. All treatment decisions were based on the supervising clinician's judgment. All patients were monitored for at least 2 hours postchallenge and instructed to contact the clinic for any delayed reactions. If patients passed the OFC without reactions, they were given information on how to add baked egg into their diet (see Table E2 in this article's Online Repository at www.jacionline.org).

Demographics and clinical characteristics of the patients are detailed in Table I. Of the 100 patients challenged, 58% were males and their median age was 5.9 years.

In all, 66% of the patients tolerated baked egg, 31% of the patients reacted to baked egg, and 3 challenges were considered inconclusive. There were no differences in age, sex, or a clinical history of past ingestion/reaction to egg between the 2 groups.

Patients who passed the OFC without reactions were found to have lower serum egg white sIgE (median, 2.81 kUA/L) than did those who reacted during the challenge (median, 5.85 kUA/L),

$P = .001$. However, both groups had identical median skin prick test wheal size (7 mm) (Fig 1). The sensitivity, specificity, positive predictive values, and negative predictive values for various egg sIgE cutoffs are provided in Table II.

The majority of reactions (71%) occurred before 50% of the total dose had been ingested. Five of the 31 (16%) reactions occurred during the 2-hour observation period after the patient had ingested the entire serving size. Multisystem symptoms occurred in 23% of the OFCs, whereas isolated symptoms affected the gastrointestinal tract (39%), skin (19%), oropharynx (16%), and respiratory tract (3%).

The majority of reactions (80.6%) were mild and treated with antihistamine (liquid diphenhydramine or cetirizine) only. In addition to an oral antihistamine, 1 patient received a nebulized bronchodilator (albuterol), 3 patients received oral steroids, and 4 patients received intramuscular epinephrine. No patient received more than 1 injection of epinephrine or required observation beyond 2 hours. There were no reported delayed reactions.

We describe results of the first 100 consecutive baked-egg challenges done in our outpatient allergy clinic, confirming that the majority of egg-allergic children tolerate baked egg. Neither clinical history (ever having reaction or anaphylaxis to egg) nor skin prick test provided helpful information to identify the patients who tolerated baked egg. Serum egg white sIgE levels, however, were statistically different between the 2 groups. Varying predictive values are given in Table II. For example, an egg white sIgE cutoff of 2.5 kU_A/L had a negative predictive value of 89%, a positive predictive value of 44%, a sensitivity of 87%, and a specificity of 48%. In addition, the symptoms in patients with a serum egg white sIgE of less than 2.5 kU_A/L who reacted were mild and treated with oral antihistamines only. On the other hand, if one were to select an egg sIgE of less than 10 in this cohort, the negative predictive value would decrease to 71%, a number that may still be acceptable to some clinicians; however, the specificity would increase to 94%, thus capturing a great deal more children who were tolerant to baked egg. While creating cutoffs from a retrospective cohort may be biased by patient selection, it can provide guidance to the everyday clinician seeking patients who are likely to pass a baked-egg challenge in order to minimize in-office reactions. In addition, given the range of egg white skin prick test wheal sizes (0–19 mm) and sIgE levels (undetectable [<0.35]–75.4 kU_A/L) in our cohort, we feel that the study population is representative of egg-allergic patients seen in a typical allergy office. Finally, reactions to baked egg were comparable in severity to the reactions reported in our large series of open OFCs; 12.9% of the reactions to baked egg were treated with epinephrine, whereas 9% of the reactions to all OFCs were treated with epinephrine.⁹

In summary, we report data from 100 consecutive open OFCs to baked egg performed in an allergy office. Given the nutritional, social, and immunologic benefits that baked-egg-containing diets may provide, our data support the conclusion that the benefits of performing outpatient OFCs to baked egg far outweigh the associated risk of the challenge for select patient populations.

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Pancreatitis as a novel complication of aspirin therapy in patients with aspirin-exacerbated respiratory disease

To the Editor:

Aspirin-exacerbated respiratory disease (AERD), previously termed Samter triad, is an adult-onset disease characterized by asthma, hyperplastic chronic sinusitis, nasal polyposis, and hypersensitivity to aspirin or other nonsteroidal anti-inflammatory drugs (NSAIDs). Although the upper and lower airway inflammation seen in patients with AERD is exacerbated by the ingestion of aspirin and other NSAIDs, the disease progresses independently of exposure to these medications. Since 1922, when this syndrome was originally identified by Widal,¹ and 1967, when it was further described by Samter and Beers,² the clinical efficacy of aspirin desensitization and ongoing aspirin therapy has been well established.³ Aspirin desensitization is a procedure whereby patients receive increasing doses of aspirin, usually to a dose of 650 mg, over 2 to 3 days. If these patients continue to take aspirin on a daily basis after the desensitization procedure, many of them demonstrate improved control of their asthma and sinus disease.

Chronic aspirin therapy can result in adverse drug reactions in a minority of patients with AERD, with gastrointestinal involvement being the most common. Berges-Gimeno et al³ evaluated 172 aspirin-desensitized subjects, 24 (14%) of whom had to discontinue aspirin therapy because of side effects: 14 had epigastric

TABLE E1. Baked-egg recipe developed at the Jaffe Food Allergy Institute

Yield: 6 muffins (1/3 egg per muffin)

Ingredients:

- 1 cup flour (or flour substitute)
- ¼ teaspoon salt
- 2 tablespoons rice milk (or soy milk, cow's milk, almond milk)
- 1 teaspoon baking powder
- ¼ teaspoon cinnamon
- 2 eggs
- ½ cup sugar
- ¼ cup corn oil
- ½ teaspoon vanilla
- 1 cup mashed ripe banana or applesauce

Directions:

1. Preheat oven to 350° F.
2. Line a muffin pan with 6 muffin liners.
3. Mix the liquid ingredients: milk or milk substitute, canola oil, vanilla extract, mashed ripe banana or applesauce, and eggs. Set aside.
4. In a separate mixing bowl, mix the dry ingredients (flour, sugar, salt, cinnamon, baking powder).
5. Add the liquid ingredients to the dry ingredients. Stir until combined. Some small lumps may remain.
6. Divide the batter into the 6 prepared muffin liners. Depending on the size of your muffin tin, you may need to fill the muffin liners all the way to the top. If you make more than 6 muffins, please note how many muffins you made and bring at least 2 muffins with you on the day of the challenge.
7. Bake for 30 to 35 min or until golden brown and firm to the touch.

TABLE E2. Instructions for home introduction of baked egg (for patients who pass baked-egg OFC)

All parents are recommended to add baked-egg products into the child’s regular diet if they pass a baked-egg OFC
Examples of products include the following:
Store-bought baked products with egg listed as the third ingredient or further down the list of ingredients
Home-baked products that have 1 egg per 1 cup flour or 1 to 2 eggs per batch of a recipe (yield 6 servings)
If home-baked products are offered, we recommend feeding 1 serving at a time (with at least 2 h between servings)
Examples of products that have egg and do not qualify as baked egg:
Caesar salad dressing
Custard
Eggs in natural form: hard-boiled, scrambled, poached, etc
French toast
Frosting for cakes and pastries
Mayonnaise
Quiche